Abstract

Aim

The aim of this present study is to evaluate the cytotoxicity of stereolithographic 3D printing materials for varying time intervals using MTT assay and application of these materials for intra-oral usage.

Materials and Methods

Clear aligner trays were 3D printed using stereolithography apparatus (SLA) using 3 different 3D printing materials (Invisalign®, Dental LT® resin, Accura 60®). The cytotoxicity of these materials was tested using MTT assay. The samples were introduced to Dulbecco's Modified Eagle Medium (DMEM) which served as the extraction medium. Fresh medium was changed at 1, 3, 5 and 7 days. Cytotoxicity of these materials were tested on 3T3 embryonic fibroblast cell line. $1^{st.}$ 3^{rd}, 5^{th} and 7^{th} day extraction medium of all 3 samples were introduced to triplicates of the cultured fibroblast cells in a 96 well microplate. Cell growing in normal medium served as control. The cells were then incubated for 24 hrs after which MTT assay was done to measure optical density of each sample at 570nm. Cell viability % was calculated for each sample.

Results

The results were analysed using one-way ANOVA and Tukey test. Intragroup findings were statistically significant for only one material (Accura 60®). There was a statistically significant difference in intergroup cell viability values for all 3 materials (Invisalign, Dental LT, Accura 60).

Discussion

Invisalign® and Dental LT® had better biocompatibility than Accura 60®. Accura 60® which is a polycarbonate-based material showed the maximum cytotoxicity on day 1 and intra group

cell viability differences for Accura 60® were statistically significant. This is due to increased leaching of Bisphenol A(BPA) associated with polycarbonate.

Conclusion

Invisalign® and Dental LT® materials are safer for intraoral orthodontic usage as both the material are biocompatible. Accura 60® material showed increased in-vitro cell death suggesting that it is non-biocompatible for intraoral usage.

Keywords: Cytotoxicity, 3D printing, Stereolithography, MTT assay, Biocompatibility